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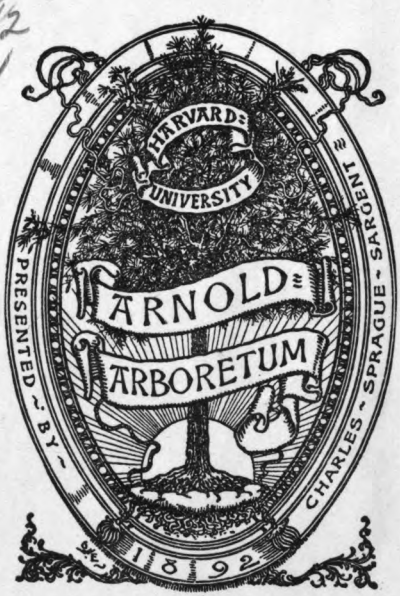

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TASMANIAN

. FIELD NATURALISTS' CLUB. .

TASMANIAN WILD FLOWERS.

BY

L. RODWAY.

Reprinted from "The Daily Post."

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PREFACE.

The following articles dealing with a few of our commoner wild flowers were written for "The Daily Post." The Proprietors of the paper have generously placed 200 re-prints at the disposal of the Field Naturalists' Club.

The object of the articles is to stimulate the study of Botany amongst our younger members, at the same time subjects other than the mere examination of the flowers have been introduced as an attempt to broaden the field of thought.

Specialisation in study is absolutely necessary with whoever desires to excel, but he only can successfully specialise whose observation has already covered a wide range.

L. RODWAY.

Hobart.
December 1908.

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TASMANIAN WILD FLOWERS.

In this series of articles on wild flowers it is intended to draw attention to the more noticeable features and at the same time to include some general information, together with a little of what is more especially called science. Technical names will be avoided as much as reasonable, but it is not possible to abstain completely from their use without crippling description. The names used are only such as are in common use among gardeners.

The common heath is one of the most beautiful among our native flowers. It grows in most places, and is to be found in flower at almost any time of the year. For this reason I will place it first, and make use of it to point out some of the general features of a plant, and more especially of a flower.

A heath plant may vary in size according to whether it lives in a nutritious soil or a poor one, also whether it receives consistent supplies of water or not, but it never attains the dimensions we call a tree nor the succulent short-lived condition we call a herb. These conditions of plant life do not indicate any true relationship, for in some families, all forms, herb, shrub, and tree, may be found, but it is a point worth noting that the family of which our heath is a conspicuous member only contains shrubs, though some are very small and others become almost of the condition of small trees. The family is a large one, and, like all large families of plants, contains a diverstiy of forms, but, however they may vary, there is a common likeness in certain features that justify their being placed in one group.

Our heath may be taken as a type of the family, so that in learning its details we are also gaining a knowledge of the family to which ite belongs. The leaves are small and of a simple shape, they are also rathe thick and of a hard texture. Thi structure of the leaf is very commo in Australian plants, and is ver noticeable when compared with th leaves of garden plants that hav been brought here from Europe. Thi is a matetr of some importance, fo it indicates that climate in Australi has not recently been suitable for th development of plants with broad, suc culent leaves. The flowers are born one at a time along the slende branches. They are of various shade of red to pale pink or quite white Color in a flower is of use as a specia attraction to certain flying insects, an is often constant in a wild species, bu in heath it appears to be of no specia consequence, as all shades may b found in the same locality and equall fertile. Probably all flowering plant may produce white flowers, but as i many species this absence of colo does not attract the insect require to cross fertilise thy do not produc fertile seed, and consequently die out With our native heath this is not so and white flowers produce as muc seed as red ones. Let us examine the flowers

As already stated, they occur singl along the branches, each being situ ated in the angle between a leaf an the branch. This angle has often t be referred to in describing plants, s instead of constantly repeating th definition it is convenient to call it th axil of the leaf. It is of use to not that the flowers of heath occur singl in the axils, because this is a regula habit, and affords an easy means of a once recognising its distinction fro other closely allied genera which bea more than one flower. The flowe stalk is very short and covered wit little leaves much smaller and les green than the ordinary leaves of th plant. In botany these reduced leave whether they grow on the flowe stalks or elsewhere, are called bract

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The last of these bracts are rather larger than the rest, and five of them nearly in a row closely surround the long colored tube. In most flowers this circle is not so closely connected with the other bracts, but appears more clearly as part of the flower itself, where it appears as an outer green or colored envelope. As this circle is present, in most flowers, and its description is of great importance in defining the difference between species, it has received a special name, It is called the calyx, and the bracts of which it is composed are called sepals. The duty of the calyx is principally that of protection to the more important organs of the flower while they are forming in the bud.

Next above the calyx will be seen the long colored or white tube that forms the conspicuous part of the flower. This is the corolla. It ends in five spreading lobes. In unusual cases the lobes may be more or less than five, but these are departures from the normal or common habit. These unusual forms are of great interest to the gardener, for seed from such often produce much modified flowers, such as double forms. Comparison with other forms leads to the conclusion that the tubular corolla of heath is made up of the union of five otherwise separate pieces, each of which is called a petal. A great number of flowers have their corollas formed like this of united petals, and a great number on the other hand have the petals distinct from one another.

The work of the corolla is to attract insects. Most flowers with conspicuous corollas form honey at the base of the tube, nad their bright color acts as a sign to the flying insect where honey is to be procured. The insect, in struggling to reach the honey, gets sprinkled with pollen. When it flies into another flower it may leave some of this pollen on that flower's stigma, thus causing cross fertilisation. Many flowers are so nicely adapted that only one class of insect can successfully visit them. The corolla tube and insect's proboscis appear to be mutually adapted. There are numerous cases in nature where details of plant and animal structure are very closely and perfectly adapted to their peculiar state. This has caused naturalists with fervid imaginations to see much more accuracy of modification than there is justification for.

The length of the tube of the corolla in our heath appears to have no signification in relation to the insects that visit it, as there is a very wide range in its length in various individuals without affecting the amount of seed produced; also other species of the same genus which appear to be fertilised by similar insects consistenely have but very short tubes.

If the corolla be pulled off and split open five little bodies will be seen adhering to its inner surface near its end. They are so small as to require a lens to examine their form. Each is a little sack, which, when ripe, splits down the centre and exposes some pale dust which it contains. It will be noted that the sack is attached by a short stalk to a part of the corolla just below the division between two lobes. If you look carefully you will see that a light line continues down the corolla from the sack, this is a part of the stalk of the sack grown to the corolla. Each sack with its stalk is called a stamen. The sack itself is called an anther, and the dust it contains pollen.

The anther of our heath consists when mature of a single chamber. This is unusual. It is the rule when an anther is forming for four places to be developed in which pollen is formed. In anthers of some flowers all four chambers remain at maturity. This will be noted when we come to Purple Heather. The most common condition is for these chambers to coalesce in pairs so that the matured anther is two chambered. The pollen is a most important product as it is necessary for it to blend with the ovules in order to produce fertile seed.

If we pull off the corolla and turn back or also pull off the sepals we shall be able to examine the centre of the flower. This part is of exceptional interest for it is here that the seeds are developed. When stripped of these outer parts there is found in the centre a small spherical body from the top of which extends a slender column which terminates above in a head shaped like a small pin's head.

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These parts being of so much importance to botaniss in comparing different plants have received special names. Though we do not want to worry more than we can help with their names, yet as with every flower we examine it will be necessary to refer to these parts, it will be less trouble to learn these names at the outset than to keep repeating their descriptions, and, further, this little bit of knowledge will be of value in all future botanical studies.

The entire organ I am now describing is the pistil. The spherical body at the base is the ovary, the slender column is the style, and the little head is the stigma. If we look carefully at the ovary it will be seen that it is not a simple sphere, but has five convex protruberances running lengthwise, and if we cut it across we find that it is made up of five chambers. This indicates that the pistil of heath is compounded of five units. Just as each of the five units of the calyx is called a sepal and each of those of the corolla is termed a petal, so each of the parts of the pistil is called a carpel. This in our flower may at first seen unnecessary, but it is required for the better understanding of a flower, and in many other cases the carpels are not blended together, each carpel being distinct, and each bearing its own style and stigma.

The pistil of heath is therefore made up of five blended carpels. Each of the chambers is really an ovary, though we here for the sake of convenience apply the term to all five. The apparently simple style and stigma are also really five styles and stigmas intimately blended in one. There are two other small features that should be noted as they are of importance in comparing our plant with its relations, the style is sunk in a depression between the five ovaries, and in each ovary there are many minute ovules or incipient seeds arising from a spot towards the inner angle of each chamber. When the flower withers the fruit is formed. This is not much changed in character. The ovary only becomes rather larger and dries. It then bursts along the back of each carpel to allow the minute seeds to escape. Such a fruit is called a capsule.

The plant most commonly called heath with us is a native of the whole south-eastern portion of Australia, as well as Tasmania. It has some very close relatives, for instance Native Rocket, very common on heaths, and Coral Flower on mountain tops, but it can always be distinguished from them by noting that on its corolla near the base are five depressions which are wanting in the other species. The name heath, like many other names adopted for plants in Tasmania, is a piracy. Our plant is not a member of the same family as English and African Heaths.

Everyone, almost without exception, has some love for flowers, especially wild ones, and it is necessary, in order to receive and impart ideas, that these should have names. The scientific person manages this tolerably well by giving every plant a name consisting of two words. The first word is formed from a Greek derivation or model, the second from a Latin one. The first is equivalent to a surname, and notifies the small group or genus to which the plant belongs; the second is the personal name. But those who donot approach the subject from such a serious point of view object to these long and too often weird appellations. They ask for names in the mother tongue. This has been supplied fairly well in older countries, where long usage has fixed upon popular names that are well recognised.

Unfortunately with us very few plants have as yet received popular names, and in many instances they have been so recklessly given that they tend to mislead. It is common to give names to our native plants that belong to quite different sorts of plants in the Old Country, as Heath, Laurel, Cherry, Myrtle, and a host of others. And, again, the same name is given to different plants sometimes even in the same locality, as Dogwood, Native Pear, Red Gum. Grass tree is a case in point. Its name is given to the Richeas, which is a genus related to the heaths, and also to the Blackboys, which have numerous string-like leaves and a tall, club-like mass of flowers, which are related to the Lilies and Rushes.

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Grasstree in this article refers to the Richeas. There are only eight species in this genus, and it is interesting that seven of these are found only in Tasmania; the eighth occurs on the Australian Alps. They are fairly common with us, but principally on our mountains. They are tall shrubs, and the leaves vary in size, according to the species, from under an inch long to many feet, but they are all similarly structured. They are of a simple form, with parallel veins, recalling the form of leaves in palms and lilies rather than plants of a higher order, and the base is very broad, and clasps the stem all round at the base, so that when they fall they leave on the stem a circular scar.

In the Giant Richea, which only occurs in the Western half of Tasmania, the stem is simple, but often very tall, the leaves very long, and the flowers are in small bunches closely hidden at the bases of the leaves. In the other Richeas the flowers are massed at the ends of the branches. They also are made up of little bundles in the leaf axils, but where the leaves are relatively large they soon fall off, and the flowers remain, and where they are small they do not hide the flowers from view.

Richeas, though so different in appearance, belong to the same family as the Australian Heaths. Plants are arranged according to the structure of their flowers, and when we examine the flower of Richea, its relationship becomes at once apparent. The habit of the flowering is different from Heath. In that plant the flowers are borne singly in the leaf axils along the branches; in Grasstree they are clustered in the leaf axils at the end of the branches only. The structure of the flower is very heath-like, but it has two marked differences—one in the corolla and the other in the stamens. The outer envelope of the flower, the calyx, is, as in the last instance, made up of five little sepals. The corolla is tubular, but the free ends are very minute and the top of the tube is conical and nearly closed. At maturity, that is when the internal parts are ready to proceed to the formation of seed, the corolla splits round near the base, and the upper portion falls off. This, which in our common mountain Grasstree is white, looks very like a grain of rice, and on that account the shrub is often called rice plant. The stamens are five in number, and differ from those of Heath in not being united to the corolla. They are inserted into the top of the stalk close below and around the pistil. The central organ of the flower does not differ in any conspicuous manner from that of Heath, and, like it, the fruit is a five-celled capsule, each cell containing many seeds.

There is a plant common with us with a very similar habit to Grasstree, only when the leaves fall they do not leave a scar, and the petals, which are pink or white, are not united in a tube, but are free from one another, and remain for a long time on the flower. It is called Sprengelia.

There is also a handsome shrub in our western district which in habit and appearance of leaf is exactly like the Giant Grasstree, but instead of, like that shrub, bearing little hidden bunches of flowers, its inflorescence is terminal. The flowers are very numerous in spreading branches, and the corollas are like little pendant bells. It is a member of a genus named Dracophyllum.

In all these, as with the Heath, the fruit is a five-chambered, many-sided capsule. But this condition is not universal in our family of Heaths. There is another big section in which the fruit is very like a berry, that is, it is fleshy, and each carpel of the pistil holds but one seed. A good example of this is our pretty little Pink Berry. This is common on most of our hills, and is very similar in habit to Heath. The leaves are narrow, harsh and sharp-pointed. The flowers are placed singly in the upper axils. This is a matter that should be noted, for it is a point seized upon by botanists in forming genera. There are in Australia a very great number of plants of close relationship to the Pink Berry, and the natural method which is adopted by some botanists is to group them together in one large genus. Others, in order to render them more convenient to manage, have split the large natural groups into smaller ones, with subsidiary or arbitrary distinctions. So near relations to Pink Berry, but with more than one flower in each axil, are placed in other genera.

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The little flower stalks of Pink Berry are clothed with many little bracts, the calyx is made up of five little bract-like sepals, the corolla is a little white or greenish tube, with five lobes, and bears a few fine hairs on the inner surface. The stamens are five in number, and their filaments closely cohere to the petals. The ovarian part of the pistil is not depressed at the top, as in Heath, but is continuous, with the style, and it has five chambers, each containing one ovule. The fruit is red; the outer part is fleshy and the walls of the chambers are hard and united to one another, so as to form a central stone. Pink Berry belongs to the genus Cyathodes, to which also belongs Cheese Berry and six others not as common. Seven of the genus are confined to Tasmania.

Cyathodes is closely allied to Leucopogon, or White Beards, which differ chiefly in bearing more than one flower in each axil, and the corolla is densely covered on the inner surface with white hairs. White Beards are very common in amlost any district, from dry hills, where little heathy forms are found, to the sea coast, where they are shrubs with white or red currant-like fruits.

Another common genus closely allied to Lissanthe, to which the pretty little Peach Berry belongs. It is a little Heath, very like common Heath, but the flowers are many in each axil and the fruit is fleshy.

Our native Cranberry, which is no relation to the English Cranberry, also belongs to the family of Australian Heath. It has a very long dark red corolla tube, very small lobes and tufts of hairs are placed on the inner surface and inflected in the throat. The fruit is fleshy, with a central five-chambered stone. There are yet other members of the family, but it will only confuse matters to refer to them.

The Australian Heaths on the one side, and the African and European Heaths on the other are closely related, but one feature has enabled botanists to divide the groups. In Australian Heaths the stamens at maturity have anthers, with one pollen sack; in the others the pollen sacks are two. The Australian Heaths are named after their typical genus, which is Epacris; so the family is named Epacridaceae. The other group is named after the typical genus Erica, the elore Ericaceae. The first is confined to Australia, New Zealand, and the adjacent Pacific. The other is chiefly African and European, but is really world-wide. We have four species of it in Tasmania, of which the commonest is White Cluster Berry, known to botanists as Gaultheria hispida.

Prickly Beauty

This flower is fortunate in having an original popular name all to itself. For once, the people who gave names in days that were earlier did not attach to this plant an old and quite inappropriate name belonging to a shrub at the other side of the world. Most people at all familiar with the bush know Prickly Beauty know it as a small shrub, with small sharply-pointed leaves, that are concave on the upper surface. The flowers are few in the upper axils, and are of the form so familiar to us all in the Peaflower. For purposes of general information, any other of our native peaflowers will do to illustrate, but as this family is very large and the members differ only on small differences, it has been thought necessary to divide them up into genera, marked very often by trivial differences, so in describing this flower it will be advisable to take note of these arbitrary marks, wherefor it is best to follow this article with a specimen of the true Beauty.

As already stated, the flowers are few, and are placed singly. In some of the leaf axils they are not massed together at the ends of the branches as they are in many closely-allied shrubs. Each flower is on a distinct stalk. The calyx is made up of five sepals, but, unlike those of the heath family, which are all separate from one another, here they are more or less united, so that the calyx is in the form of a broad tube, with five short lobes, and of these the two upper lobes are rather longer and more united than the lower three. Though apparently trivial, this is an important matter to whoever wishes to understand the classification of peaflowers.

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The corolla is made up of five ɛtals, which are very unequal in size. he upper one has a very narrow ɪse, above which it broadly expands to a conspicuous disk, slightly ɔtched on the upper margin; it is aced outside the other petals and ɪcloses them in the bud. It has ɛceived the name of the Standard. ext are two small oblong petals, laced one on each side; they are ɪlled the wings. The next pair are aced below, and are more or less ɔherent along the lower margin, ɔrming a boatlike space on their pper surface, in which lie the essen- al organs of the flower. These two ɔwer petatls are together called the eel. The petals are all yellow, more r less marked with purple brown. his arrangement of the corolla gives ɔ peaflowers their peculiar appear- nce, which to some vivid imagina- ɪon has recalled the idea of a butter- y. As the scientific name of a genus f typical butterflies is Papilio so otanists commonly call peaflowers apilionaceous, and give to the family he name of Papilionaceae.

A thing that should be noted is that he petals are not attached, as in eath, to the top of the flower-stalk, ut to the inner surface of the calyx ube. The insertion is so close down hat this is not very noticeable, but ; is the commencement of the re- ɪoval of the corolla from the top of he stalk that develops further in oses, saxifrage, and many other amilies, to culminate in the myrtles nd umbellifers. It is a matter of rst importance in the sorting toge- ɪer of different families of flowers.

The stamens are ten in number. lach consists of a slender filament nd a two-chambered anther. They re inserted on the calyx tube close ɔ the base of the petals. The sta- ɪens are all free from one another. his is a condition that marks a sec- on of shrubby peaflowers, far more ɔmmon in the Southern than the orthern Hemisphere. Other sec- ɔns which are also represented in ustralia have the filaments united r part of their length in a tube, hich may be entire or open above the nine lower filaments are united, ɪt the upper one free.

The pistil of a peaflower is very mple. It consists of a single carpel, hich develops few or many ovules. The pistil in the flowering stage is al- ways slender. It lies in the centre of the stamens, in the cavity of the keel, From the end of the ovarian cavity it is prolonged in a slender style, which bends upwards towards the tip, so that the small terminal stigma comes to lie amongst the anthers of the end of the keel.

Comparison with other plants and study of malformations has led to the conclusion that a carpel is a modified leaf-ear, and usually bears the ovules on its margin. This is easy to ex- amine in a peaflower, as no complica- tion is introduced by the blending of many carpels. The carpel is a leaf which in our flower is bent together lengthwise, so that the margins meet together and the ovules hang down into the ovarian chamber from above.

The fruit of a peaflower is a legume, a form of fruit so well known to us in the pea or bean. On maturity, it splits along one or both margins to expose the seeds. The shape of the pod and the number of the seeds nor- mally present are of interest, and are used to help to arrange the huge family of peaflowers in groups. In Prickly Beauty the pod is very small, nearly round, splits principally along the upper maragin, and contains only two seeds.

Those who wish may note two de- tatils to assist in identifying the genus to which Prickly Beauty belongs, namely, Pultenaea. In many plants, at the base of the stalk of the leaf there is a pair of processes, arranged one on each side. They may be in form anything from large and leaflike to little spines or tubercules. They are called stipules. In the genus to which Prickly Beauty belongs sti- pules are generally, but not always, present, but when they are they are always small, brown, spiney bodies, and in this form they appear here. But a more constant mark of a Pul- tenaea is that there are two little sti- pule-like bracts called bracteoles, placed upon the calyx.

Peaflowers appear to be especially constructed to make use of the visits of large insects, such as bees, for pur- poses of cross fertilisation. In the centre of the flower, around the base of the pistil, a sugary fluid is secret- ed. A bee in search of this alights

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on the keel, and in struggling to reach this nectar it depresses the point of the keel; the anthers and stigma immediately jump up, with the result that the pollen is dusted on the under part of its body. When the bee visits another flower, the same process recurs, with the result that the stigma is dusted with the pollen it brought with it. It will be readily perceived there is nothing in this to prevent the pollen of its own flower getting on the stigma. This really occurs, and effects fertilisation if no foreign pollen is present. Here comes in one of the notable provisions to prevent self-fertilisation. Its own pollen acts very slowly, and if not given too long a start the much more rapid developing foreign pollen overtakes it, and fertilises the ovules. This selection of one pollen over another is called prepotency.

There is a small family to which our love creeper belongs whose flowers at first sight resemble peaflowers, but it is only a general resemblance; they are really not at all like, and the fruit is not a legume. They will be dealt with later.

It would be a natural conclusion that plants related to one another should have similar fruits and conversely that similar fruits in two plants should indicate a close relationship, but this does not appear to be the case. Fruits of like structure do not indicate common descent. They are specialised developments to ensure the effective dispersal of the seed, consequently any advantageous change in form of any member of a family may give it an advantage which will enable it to reproduce its kind more successfully than its less fortunate relatives. The same thing applies leaves. Consequently very different leaves may be found in one family and similar leaves may be found in very different ones. Particular forms of fruit or leaves must not therefore be taken to mean relationship. The leaf of the plane is vey like a maple. The fruit of the blue climbing berry, which is closely allied to pittosporum, is similarly constructed to the fruit of the blue berry and turquoise berry, which are both lilies. But although this similarity of fruit and leaf is not to be relied upon as indicating relationship, yet we find in some instances a pecular form of leaf or fruit may be common to one family, further, it may be confined to the members of one family. This fact has led enterprising geologists to discover in certain leaf impressions the presence of oaks, willows, elms, and many other families in rock strata. It is certain that some, possibly many, of these conclusions are erroneous.

The form of fruit we learnt in last article to call a legume appears to be only found in one huge family, and further, with slight modification, is the only form of fruit found in it. There are in some other families fruits very close but not quite legumes, and the family of which a legume is the typical fruit is therefore called the leguminous family. This family is very large and on the structure of the flowers, falls into three natural subfamilies. There is the papilionaceous group, treated in the last article, where the flower is irregular, the upper petal is very large, embracing the rest, and the stamens are ten; the cassia group, which does not occur wild in Tasmania, where there are a pair of small petals above and not constantly ten; and the mimosa group, where the petals are minute and all equal, and the stamens are very numerous and long.

Our wattles belong to this last group. We have many different wattle trees and for convenience of noting them in bush walks we can divide into three groups according to peculiarity of leaf. One group has divided leaves, a second has flat blunt leaves, the third has prickly leaves. Of the first group we have three forms, silver wattle, which flowers in early spring; black wattle, which flowers at mid-summer; and green, or river wattle, which flowers in early autumn. Of the broad, blunt-leaved forms blackwood, native willow, and false boobyalla are the commonest. There are many prickly forms which are mostly known by the one name prickly mimosa, corrupted in some parts to prickly mosey. All the wattles when young have divided leaves, and in response to injury at least blackwood may when older throw out some divided leaves. The simpler forms are produced by broadening of the leaf stalk and suppression of the leaf ~~leaf stalk and suppression of the leaf~~

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lets. This is a special adaptation to make them better suited for our very sunny climate. This reduction of leaf surface with a thickening of structure is common to sunny regions, especially where the rainfall is not correspondingly heavy. It is very noticeable in Australia. If plants do not adapt themselves to changed conditions they generally die out.

The present condition of the earth's atmosphere is not very favorable for plant life. By far the greater part of a plant's body is made up of carbon. This in all green plants is derived solely from the carbonic acid present in the air. This gas is present in minute quantity on the average only three or four parts in ten thousand. Most plants will live where there is even ten parts of this gas in one hundred and the most favorable quantity for plant life as a whole appears to be as high as seven to eight parts in a hundred. This leads to the conclusion that the most favorable condition for plant life would be if our atmosphere contained two hundred times as much carbon dioxide as it does. An increase of the carbonic acid in the atmosphere would have a further effect in reducing radiation. Consequently, if this gas were present in larger proportion, not only would more food be available for plant growth but the air would be moister and climatic changes less marked. Under these conditions it is reasonable to conceive a luxurious plant growth and in favorable conditions massive accumulations of plant remains. What this condition would be like an examination of the plants found in our coal measures give us some clue, and what it is like at the other extreme we can observe in the semi-desert flora of plants in Australia. A good illustration of adaptation to enable a plant to still survive is observable in these wattle with reduced foliage.

The flowers of wattles, from their small size and the habit in most species of their being massed together in heads, renders them somewhat difficult to examine, and impossible without a lens. Each of the fluffy spheres we meet with consists of many flowers. We can detect this better before they have opened. The calyx is very small and consists of four or five sepals that may be free or more or less united according to the species. The corolla is scarcely larger, its petals are all equal and are of the same number as the sepals, they are seldom united. The stamens are very numerous, their filaments are very long, slender and free from one another and bear at the tips minute anthers. The solitary carpel which forms the pistil is minute but yet contains several ovules, it is prolonged into a very slender style which is much longer than the stamens and tipped with a minute stigma.

The fruit is a legume, variously shaped according to the species. Wattles flower copiously, yet seldom sets much fruit. This would lead to the suposition that it is necessary for the flowers to be cross-fertilised. A considerable amount of honey is formed and bees much frequent them. Many wattles develop honey secreting glands on the leaf stalks, or on the margins where the leaves are reduced to broadened stalks. These glands only make honey during flowering. It is possible they serve as an attraction to small birds.

Wattles belong to the genus acacia. and it is a pity where a scientific name is so euphonius it is not used more as a popular name. Acacia is the largest genus of Australian plants, it contains about three hundred and fifty species, and of all these only one extends beyond the confines of Australia, though other species of the genus occur in Asia and Africa. The pea family is one of the largest of the flowering plants containing many thousand species and is found in all parts of the world except the coldest places. It is the largest of Australian families, containing more than a thousand species, yet, strange to say, in the adjacent country of New Zealand, which does not differ materially in climatic conditions, and has a very large flora, it is very poorly represented. There are there only seven genera, containing in all twenty-six species. The reason for this is not explained.

The seeds in the family are much alike, generally of the character of small flat beans. They have one common feature in that they retain their vitality for a considerable

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period No credence must be given to the tales of excessive duration in this respect often claimed. It is probable that practically fifty years is about the limit during which the most hardy seed can retain its power of germination. When a fire has gone through a district wattles often spring up in great numbers, though the parent trees had not been observed on the land before. It is often claimed that the seed had lain in the ground for generations from a previous wattle forest. It is difficult to disprove this, but it is more probable a constant supply of seed had been dropped on the land by birds, and those of the last few years respond to the changed conditions. Some birds, especially pigeons, swallow immense quantities of wattle seeds, and as they are indigestible, are dropped all about the neighborhood. If we allow a ten years' life to the seed the crop would be quite heavy enough to account for the densest appearance of young plants. Different seeds have very great variety of vitality, some, for instance elm, require to be sown at once, oak seldom germinates when a few months old. There is a further reason to assume that at least most of the wattles springing up after a fire are from recent seed, as that lying near the surface could alone be affected, old seed would be buried too deep.

Buttercups are not as conspicuous in the meadows of Tasmania as they are in England. It is hardly a typical wild flower with us, yet it is sufficiently common all through the year from spring till autumn to enable a student to easily find a specimen. It is chiefly of interest to us here because the form of the flower is very simple, and differs greatly from the forms we have already treated. We have several native buttercups, and a few introduced ones. They are all shortlived, and of succulent tissues. Such a condition receives the popular name of a herb in contradistinction to shrub, where life is prolonged, and the tissues become hard and woody. but the plant never attains large proportions, and tree, which differs only in its size, being larger than a shrub. These are popular names that mark what is meant well enough for all practical purposes.

Buttercups are found throughout the world, and prefer damp situations. Our prettiest form, which is also the commonest, is fairly widely found in grassy places, and where the scrub is not dense. It is found almost throughout Australia and New Zealand, but not elsewhere. It grows often a foot high, and bears a few bright yellow flowers and few leaves placed at the base of the stem. A marked feature is that it is clothed over leaves and stems with delicate soft hairs.

The genus of buttercups has received from botanists the name Ranunculus. As florists and gardeners use this name freely it is as well we should get in the habit of using it. Any scientific name that can be easily mastered should be used, as it tends to accuracy. This particular Ranunculus has received the specific name of lappaceus, which means having burrs. As our native buttercup bears nothing in its structure that can be reasonably likened to a burr, the name is not appropriate, but there it is, and there it will have to remain. It is an instance met with only too often. If we put trust in the meanings of our names we shall be often misled. It is better to receive scientific names merely as proper ones, and place no weight on their meanings.

The flower of our buttercup should be carefully examined. Outside of all comes the green calyx. It is made up of a few, usually five, but sometimes six or seven, sepals that are simple in form and not at all united to one another. It should be noted that, unlike many flowers, the sepals are not all attached to the flower stalk at the same level. This flower stalk is much enlarged at the end, and often shaped like a dome or cone, so there is plenty of room for the different organs to be attached to it.

Next above the calyx are the petals. They agree in number with the sepals, are larger than them, arise from the stalk just above them from a very narrow attachment, and they broadly expand each one into an almost round form. On the upper surface near the base of each petal may be observed a small pouch in which a sugary fluid is formed. This is the nectary, which affords an attraction to flying insects. Above the corolla

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re the stamens: they are numerous, short, all free from one another, and so inserted into the enlarged flower talk.

The pistil of Ranunculus is very ifferent from that organ as we have ound it in the plants already de-cribed. The carpels are small, nu-nerous, free from one another, and assed together on the enlarged end f the stalk. Each carpel consists f an ovarian chamber containing one vule growing from near the base. he upper part of the carpel is con-inued into a short curved style, the tigma is not enlarged, and is formed n the upper edge of the style. In ruit the carpels are little altered; hey grow a little larger, and become arder. They do not split to let the ingle seed escape, but each one falls way, and appears like a seed, and is ommonly called such.

Clematis, though so different in gen-ral appearance, has a very similar lower to Ranunculus, and belongs to he same family. We have three spe-ies of clematis in Tasmania. One is nly found in the north,and there in ew places. The other two are fairly ommon. Our common bush clema-is, which is common to cool parts of ustralia, is a tall climber; the other, hich appears to be confined to Tas-nania, is found in many grassy oods. It creeps underground, send-ng up here and there shoots of only a ew inches, covered with a few simple ark green leaves and terminal white lowers. In both these commoner pecies the flowers are almost alike n detail. For this reason some bot-nists consider them forms of one. his does not meet with the approval f those acquainted with them in their ome.

The leaves of clematis, unlike those f other genera of the family, are ar-anged in pairs, which are placed op osite one another. There is not a alyx and corolla, but only one circle f petal-like leaves. By common con-ent, where there is only one such rgan, though it may be colored like corolla, it is called a calyx, and ach element is therefore called a epal, though it may look like a petal. n both our common species of clema-is these sepals are white, and usual-y, but not always, four. The sta-ens are long, and their anthers nar-ow, ending in acute points. The pistil is formed as it is in Ranunculus, only the styles are long, and clothed with long hairs giving them a fea-thery appearance. The single ovule, instead of arising from the base of the ovarian chamber, hangs down from the top. It is common to find in flowers of clematis that one will bear perfect stamens developing pollen, not develop seed, while others bear perfect carpels but rudimentary sta-mens. Our common bush clematis ~~but the carpels are imperfect, and so~~ is called Clematis Aristata, from the aristate or pointed shape of the an-thers. The little creeping one is called Clematis Gentianoides, from its likeness to a Gentian.

The Ranunculus family, to which both buttercup and clematis belong, is a rather large one, and is well dis-tributed over the surface of the earth, but it is poorly represented in Tas-mania. We have a single species each of two other genera, Caltha and Anemone, but they are rare mountain plants, and not likely to be met with by young collectors. As will be seen the flowers in this family are of a simple type, the portions that go to make up each set of flower elements are arranged spirally above one an-other on the receptive portion of the stalk. It is an advance in complex-ity when these are arranged in de-finite circles. Again, the different parts are each clearly independent of its fellows; for instance, the petals are not united in a tube, as in heath, nor are the carpels joined to form a complex pistil. For these reasons the type of flower in the Ranunculus family is considered to be a primitive type, that is, a form that was devel-oped early in the evolution of flowers, and from which more complex forms may have been developed. This does not mean that the modified flowers commonly met with were derived from Ranunculus-like flowers in lineal succession, that they were derived from ancestors showing somewhat similar simple structure. Ranuncu-lus flowers seem to have stood still. Environment suited them, and they were quite able to live and pass on descendants without the necessity of change.

This tendency to persistence is com-mon to all parts of both animal and vegetable kingdoms. There is usual-ly room for a limited number of

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progressives, but that limit is easily reached, then the struggle destroys the surplus, except favored individuals, who have some special advantatge which, diverging from the type, enables them to maintain themselves. The result is that in both kingdoms in the present day we find present not only advanced types of beings but intermixed with them all grades or simpler forms, down to almost the most primitive. Changed conditions exterminate many links. Organisms that would thr've on our earth when it had a dense atmosphere heavily charged with moisture and carbonic acid, when the temperature was never very high, and never at all low, would not exist anywhere with presen condi tions. No link seems to be more thoroughly obliterated than the early steps in the formation of living bodies.

It must not be concluded from anything said above that all apparently simple flowers are primitive. In the evolution of flowers two processes have been constatntly at work, ever changing and obscuring things. There has been a constant advance in many different lines of descent, from the simple to the complex. At the same time, in all sorts of different genera and families reduction processes have taken place that have tended to reduce flowers from a complex to an apparently simple type. Both the advance and reduction are causes, which we are obliged for the present to refer to as changes induced in response to changes of environment. These two processes of advance and reduction have not taken place in progressive series, but have constantly oscillated in response to ever-changing conditions. The result is that it is no easy matter to unravel the line of descent of any form. We are constantly grouping together beings whose structure appears to denote a like descent and very often erroneously. There is always one conservative feature tending to restrain, and that is the possible response the being can make. Every individual plant of one species differs from its fellows. It has its own constitution with its own limited range of response, and no change of surroundings can cause it to respond in excess of that range. If such is necessary, the only response left to such an individual is to die.

Prickly Heather

There are a few very common little heath-like shrubs, found chiefly on poor soil, and in peaty situations, with pretty pinkish mauve, or, rarely, white flowers that go by the name of purple heath. This is not very appropriate, for the flowers are never purple, nor are they in any way related to heaths, either of Australia or the Old World. But they have the name, and are likely to keep it.

The two commonest forms are very close to one another. They differ in little but the shape of the leaves. One which is found chiefly in dry, mudstone country has small, oblong leaves which are rough to the touch. The other has narrow leaves, the edges of which are rolled back, and are generally smooth, but sometimes clothed with short, rigid hairs. It is generally found in heath country, at all altitudes, even on our mountain plateaus.

The flowers have slender stalks which arise singly in the leaf axils. The calyx is formed of four small separate sepals. The corolla is much larger, and except in dwarf forms is about half an inch across. It is made up of four distinct petals. Students should note that here, as in most, but not all, flowers, each petal occupies the space between two sepals, in other words, the corolla cycle alternates with the calyx. The stamens are of especial interest; there are twice as many as there are petals; they are arranged in a single row, and like those members they arise from the slightly-enlarged head of the stalk. Each stamen is quite free from any union with all its fellows, but they stand upright in a circle round the pistil, and being dark, give a marked color to the centre of the flower. The filament is very short, but the anther makes up for this by being relatively long.

This anther is of peculiar structure; it is shaped like a slightly-bent club, and the surface turned outwards is rather larger than that looking inwards. If you cut through this anther and examine it with a magnifying glass, you will find it contains two pairs of tubes running the length of the anthers, an outer pair rather larger, and an inner rather smaller. In these tubes lies the pollen. This four chambered condition is the primitive

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form, and the anthers of nearly all flowers are four-celled when very young, only in most at maturity the cells have blended in pairs, in some, as in our Australian heath family, all four have coalesced to form a single sack. But our purple heath retains the original four-celled condition. At the top the anther is very much prolonged, and is paler in color. This elongation may be easily observed to be a tube open at the top. The anthers do not, as with most plants, split open at maturity, but the pollen escapes through the tube at the top. This form of the anthers has been used in suggesting a name for these plants. The genus is called Tetratheca, which means four cases or boxes. Four-cased anthers are not confined to this genus, however.

The pistil is a very small, simple-looking object. It is oblong, and rather flat, and has a slender, simple style at its top. The ovarian part of the pistil contains two chambers, showing the organ to be made up of two blended carpels. In each chamber there is a single ovule suspended from the top. In fruit the pistil does not alter much in character, it only enlarges, and the walls become hard. At maturity it splits along each edge to allow the solitary seed to escape from each chamber. The form with the broad leaf is, in consequence of the usual presence on its surface of sticky hairs, named Tetratheca glandulosa; and the other form, though it is commonly not hairy to any marked extent, has the name of Tetratheca pilosa. Pilose is the word used in botany in indicating a surface thinly sprnkled with rather long, simple hairs.

Blue love is also often called Love Creeper, which is a more appropriate name, because the flowers are not always blue; they are sometimes white, and rarely pink. Young botanists should remember that color of flowers does not mark a difference of species. Though certain flowers are more or less restricted in this, for instance, no blue rose nor yellow aster has yet been developed, yet probably all plants may produce white flowers. If a blue rose or a yellow aster were evolved they would not be a new species, but only garden varieties.

Though the flower of love is so very different from purple heath, the structure of the pistil, fruit, and seed, are so similar that they are considered to be very closely related. Love is a small creeper with few small leaves. By means of a twining habit it climbs up the undergrowth for two or three feet, and bears abundance of pretty little flowers, extensively dispersed on its branches. Its habit is very much that of a parasite, but it is not one; it only clings to other shrubs for support. The flower is very irregular and difficult for the beginner to understand. At first sight it may be taken for a peaflower, but this is only a first impression, for it really is not at all like one, yet this has been seized on by examiners to catch an unwary student.

There is not here the clear distinction of calyx and corolla we have hitherto met with. The calyx consists of five free sepals, three outer small ones, then two that are relatively large and spreading, they are colored and look like petals, which they are commonly taken for. There are only three petals, the outer one of which is below, and is larger than the others; it is folded into a boat shape, and resembles the keel of a peaflower. The two other petals are small, placed at the side, and partly united to the stamens. The stamens are eight in number, their filaments are united below in a sheath that surrounds the pistil. The anthers are very small. The pistil consists of two carpels that are blended together; the lower or ovarian part has two chambers, in each of which is developed a solitary pendulous ovule. The style is short and curved, with a relatively large two-lobed stigma.

In growing into the fruit the pistil does not much change, except that it becomes larger and tapers below into a stalk. When mature it becomes dry, and splits along each edge to allow the two seeds to escape. The seeds are hairy, often copiously so. This is very marked in love creeper and its immediate relatives, and the genus from this has been named Comesperma, which means hairy seed. Love has also been named volubile, from its turning habit. Its full botanical name is therefore Comesperma Volubile.

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has others without 14

Tasmania, but none with the same climbing habit. The prettiest of ~~of any species, wherefor naturalists~~ them is a shrub with masses of pink flowers at the ends of the branches. It is known locally as purple broom. Comespermas are confined to Australia, but an allied genus, Polygala, or milkwort, is common in Europe. Species of this genus, with large pink flowers, are common in our gardens.

From what is contained in this and former articles students may see something of the difficulty there is in classifying flowering plants. These beings are readily divisible into two main and very distnct groups, one of which grass, rush, lily, and palm are typical forms, is known as monocotyl. The other and larger group, which contains most of the flowering plants we meet with other than those just mentioned, is commonly called dicotyl. The names are given because in the latter group the first leaves formed by the embryo are two in number, and are placed opposite one another. In the first group there is not this clear distinction of a pair of first leaves. It is more a convenience than a fact to call them monocotyls. The two groups are marked off one from the other, and are clearly two lines of descent, where from we do not know, but certainly far back in geologic times.

Dicotyls contain about 90,000 more or less different species, and as they differ from one another, not along a progressive series, but in many lines of oscillating advances and reductions, it is no wonder we cannot fix them in a convenient scheme. It is the aim of naturalists, not only to arrange species, in order that we can better think of them, but to so arrange that they shall stand grouped in accordance with their true relationship. In the flowers there is not a simple advance from the rudimentary to the complex so we have to adopt other means. We find a plant and examine it, and upon almost purely arbitrary lines, we group it with other forms that are very close to it, and call this group a species. The name species is quite undefinable. No two beings are quite alike, nor are offspring the exact counterpart of parents, consequently the name species necessarily denotes a group of more or less unstable forms. There is no hard and fast rule to bind a natur-

alist

~~There are other Comespermas in~~ ~~alist in his recognition of the limits~~ ~~disagree.~~ Common consent is the only ruling principle. When we have determined the species our plant must be we note that many evidently distinct species are very close; thus love creeper has a flower almost exactly like purple broom. Groups of very similar species are placed together in more or less arbitrary sets, called genera.

On the same plan genera can readily be brought together into families, as the ranunculus family, rose family, myrtle family, etc. We can also note relationship between many families, and more or less truthfully arrange them in natural orders. When we have done that we have reached nearly the end of our tether. We see points of similarity between some orders, and can see a marked complexity common in others, but not so well as to mark any line of order. This does not reduce things to the mathematical simplicity the human mind delights in. But plants develop and vary for their own purpose, and not specially to suit us. The groups we divide them into for our convenence do not defintely exist. Order, family, genus, species have no real existence in nature, they are only convenient abstractions to enable us to sort things out.

We have several species of tea tree, but any of them will serve equally well, as there is no great difference in their structure. The commoner are the woolly tea tree, found in damp places, and prickly tea tree, or, as known in New Zealand, Manuka, which grows on hill-sides. Tea trees and bottlebrushes belong to the same family as gum trees, the family of the myrtles. The tree we call myrtle does not belong here; it is a beech. This confusion of names is not confined to Australia; it is common enough in England, where the tree laurel is called bay, and the shrub called laurel is a plum. A Philadelphus is usually termed Syringa, and the Syringa has the popular name of Lilac. Our Australian myrtles, like the members of the family found elsewhere, are evergreen shrubs or trees, with simple leaves, which are never very large.

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A feature which is very common throughout the family is to form and store up in little sacks a quantity of various oils. It is worthy of note that you will often find the production of some peculiar compound, whether it be an oil, an alkaloid, a resin, or what not, to be produced in the tissues of all or most of the members of a family. On the other hand, the same compound may be found in isolated plants of very different affinities. Oil of citron, oil of geranium, and camphor may be mentioned as compounds that crop up in most unrelated families. But what we want to remember here is the fact that it is a common feature in plants for the whole of a family to tend towards the production of one or an allied group of compounds; thus conifers produce resin and turpentine, figs produce rubbers, solanums alkaloids and rues, mints and myrtles oils. Efforts have been made by those anxious to find intense fitness in all things to prove some special advantage to plants by the presence of these substances, but it seems far more probable they are, at least in most instances, bye-products of metabolism the organism could not help the producing. It would then rather indicate an imperfect ability to use food to the best advantage, that the protoplasts of the plant cannot make an ideal economy of its resources. This pervading whole families indicates that the modification of the functions of the protoplasts took place at or before the evolution of the group.

The myrtles are most prolific in the variety of the bye-products they produce. There is hardly an essential oil known that may not be found in their tissues. In a leaf as broad as in tea tree you can see the little pellucid sacks if you hold it up to the light. The word protoplast, used a few lines back, requires some explanation. Every plant or animal is built up of numerous little beings, as (although an extremely poor analogy) a coral reef is built up by the little coral polypes. The bulk of what we would call a plant is formed of non-vital material that was formed by the protoplasts. The only portions capable of doing those things which we call together life are little bodies of a colorless, viscid character, found wherever growth, feeding or other vital changes are taking place. These little beings are semi-independent, like men in a republic, each doing its duty and together forming an organised whole we call a plant. In most plants each protoplast surrounds itself with a cellulose membrane. If the leaf of a moss or filmy fern be held up to light, and looked at through a lens, each compartment that contains a protoplast can be seen. The name cell was originally given to the compartment and its contents, and it is at present used loosely to mean either one, the other, or both, according to circumstance, but it is better when we wish to refer to the vital elements of an organism to use the other name, as more clearly to indicate what is meant.

Tea trees have very pretty flowers, like miniature single roses. They are placed singly in the leaf axils, or at the ends of short branches, and have very short stalks. All the flowers we have examined up to the present have had one point in common: the calyx and corolla arose from or close to the apex of the flower stalk. In tea tree and the rest of the myrtles these organs arise from the side, usually near the top of what will be the fruit. This is a distinction that marks them from any other of our shrubs.

The calyx is made up of five small sepals that often remain for a long time on the rim of the fruit. The corolla is formed of five broad, white, spreading petals. The stamens are very numerous; their condition should be noted, as this marks a distinction from other genera. They are all free from one another, arranged in a single row, and are shorter than the petals. The pistil consists usually of five carpels, but not rigidly so, and in one of our species, found on the northern coast, the carpels are ten. They are blended in one mass, more or less sunk in the expanded end of the stalk. This expanded end is now called the floral tube; it is intimately blended with, and not readily distinguishable from the walls of the pistil. In older books, it is called the calyx tube. The ovarian chamber of each carpel is distinct, and develops very numerous ovules on an axile placenta. The style and stigma are simple, and arise from the centre of the ovarian portion. The

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pistil alters but little in maturing into fruit. It enlarges and dries. In some species the upper surface becomes very convex, in others it remains flat, but this is not to be trusted, as in some both conditions may be found. In one of our species, found mostly in heathy country, the outer portion of the fruit is fleshy. When ripe and dry enough to disperse its seed, the top of each chamber splits, to allow the minute, slender seeds to escape. The small, narrow seeds are common to the genus, and give it its name, Leptospernum. Our woolly tea tree is named from its wooliness, L. lanigerum. Our prickly species is named from its pointed leaves, L. scoparium.

Bottlebrushes are not so common with us as are the tea trees, yet there is no great difficulty in finding them. We have two genera of bottlebrushes, which in Tasmania differ but slightly. These genera are in the main much more distinct in Australia. Were they as much alike as our forms, there would be no sufficient reason to make separate groups of them. In both, the flowers are arranged in a similar manner. There are usually many together, in a rather dense mass, round the branch at the end. Each flower is unstalked, and partially buried in the bark. This dense massing of the flowers, with their long stamens sticking straight out on all sides, gives the peculiar appearance to which the name of bottlebrush is due. The details of the flower and fruit are so like what we have found in tea tree that they need not be described, only that bottlebrushes differ from tea trees, not only in the peculiar way the flowers are arranged, but their petals are very small, and the stamens very long, so that the flower seems to consist of little but stamens.

In Australia there are many genera of these peculiar plants, founded on the shape of the anthers, the distribution of the stamens, and the number and formation of the ovules. Our condition is much simpler, as we have but two genera. Of one genus we have but one species, which is found on the hills above the waterworks. The stamens are very long, and of a greenish yellow. Though numerous, they are arranged in a single row, and the filaments are free from each other. In many of the Australian species of this genus the stamens are a rich crimson. From this was suggested a name for the genus, namely Callistemon, which means beautiful stamens. Our one species has leaves shaped like some forms of willow. The name of the willow genus is Salix, and our plant has received the specific name Saligneos, or willow-like. The other genus Australian genus. It has received the name of Melaleuca, which means black and white an allusion to the common colors of the bark.

We have five species in Tasmania Some have puce colored flowers, and are called purple bottlebrushes, others have yellow flowers. One of the commoner species, M. squamea, common in wet heaths, bears indifferently yellow or puce flowers. Melaleuca differs from Callistemon, in the stamens being arranged in five bundles. This is not well marked in our forms, but in many of those from the mainland not only are the stamens in five bundles, but each bundle is united for a considerable part of their length, so that the stamens appear to arise from five stalks.

Our blue gum is one of the noblest of trees. Under favorable conditions it will attain enormous proportions, often exceeding 200ft. in height. It is in its young days of very rapid growth, often exceeding 10ft. in a year, while the age it may attain must be great, though we have no exact proof of what it may be. During the first few years of its life its leaves are relatively broad, arise direct from the branch, that is, without the intervention of a leafstalk, and are placed opposite one another in pairs. At this stage the stem is square. After a very few years the new leaves are shaped differently, and also differently inserted. This peculiar juvenile foliage is found in most gums, but in some it appears to have been lost, while in a few it continues throughout life. We have noted the same with wattles, and can only conclude it was the form of foliage originally possessed by ancestors, and the commoner form found in present-day gums is an adaptation to better suit climatic conditions.

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If a mature tree, that has lost all trace of juvenile foliage, be wounded, say, by the bark and young wood being bruised by blows from an axe or falling bough, there will commonly spring from the wound a bunch of shoots, which will bear again these primitive leaves. Also, if a mature tree be cut back, so that all the boughs bearing leaves are removed, a copious outburst of shoots will take place on the trunk and the remains of the branches, all with juvenile foliage. These leaves are of a pale bluish color, due to a covering of wax. When the shoot is very few years old the new leaves suddenly change in character; instead of being stalkless they have conspicuous stalks, and instead of being arranged in opposite pairs they are inserted singly, or, as it is more commonly styled, alternately, and, further, while the juvenile foliage stands out at right angles, opposing a broad surface to the light, the mature leaves hang down, so that the intense light of midday strikes them at an acute angle. From this latter reason, gum trees provide indifferent shade. The mature foliage is dark green; it lacks the copious, waxy covering of the other.

A blue gum sheds its bark. The outer portion, on drying, peels off in long strips. This does not occur at regular intervals, and does so more often on the young branches than on the old stems. There are about a hundred and fifty species of gum in Australia, and they are often roughly grouped according to the nature of the bark. In some it is persistently rough and fibrous; in others scaley; while in others it is smooth from the very base. All intermediate forms may be met with. One condition is usually, but not always, constant for one species. Trees whose trunks are covered with fibrous bark are not easily killed by a bush fire. It is a common thing to see a fibrous-barked gum tree in which all the young branches and leaves have been destroyed by fire, and the outer bark charred and black, yet the year following new shoots spring freely from the growing area between bark and wood, and in a few years litle external sign is left of the injury. A smooth-barked tree is generally killed to the base; that is, if the fire is severe.

Exactly what advantage it is to a tree to shed its bark is not quite clear. It is not confined to gum trees. The Oriental plane, so common in our streets, does the same. Trees appear to get along just as happily if they have not the habit of shedding their bark as if they have. It is probably another of the numerous instances of fortuitous development that are constantly appearing in plant and animal evolution, which, if it affords a benefit to its possessor, must for that reason be transmitted, but if of passive utility need not be eliminated.

Gums belong to the same family as the tea trees and bottle brushes, namely, the family of which the European myrtle is the type. Its flower is, therefore, constructed upon a similar design. The change that is most apparent is that the calyx and corollary seem to have vanished, and in their place is a peculiar lid, that covers the flower when young and falls off at maturity. It is this lid that gives the name to the genus, namely, eucalyptus, from eu, well; kalupto, to cover as with a lid. In bluegum the flowers are large for the genus, and are comonly placed singly in the axils of leaves; rarely with us, but often in Gippsland the flowers are smaller and in bunches of three. The ovarian cavities are deeply immersed in the expanded end of the stalk, and this is thick, roughened with glandular nodules, and marked with usually four angles. When the flower-bud is very young it is covered with an outer smooth lid, which turns brown and falls off very early. There is little doubt but that this outer lid is the calyx, the sepals of which are closely united. The inner lid is rough, like the surface of the floral tube; it becomes detached round the edge, and falls off when the inner organs are fully developed.

This inner lid is probably made up of much changed and coalesced petals. New organs are not commonly found in plants or animals, and when a peculiar structure is met with, research generally shows it is a modified development of a commonly present thing. Most species of eucalyptus have lost the outer lid, in some others it is shed very early, and while yet minute. Being quite useless in the form of flower here developed, it is being gradually eliminated.

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The stamens are very numerous, and are well developed before the lid falls. In order to accommodate are inflected, the anthers being buried deeply down by the base of the style. Soon after the lid falls the stamens expand in a ring, leaving between them and the style a succulent, green, honey-secreting surface. The pistil consists of three to six carpels, closely blended. The ovraian chambers are all distinct and immersed in the floral tube, each contains many minute ovules, arising from a placenta developed on the inner angle. There is a simple style and small terminal stigma standing up like a club from the centre of the flower.

As there is a copious supply of pollen round each stigma, and the organs are effective at the same time, there appears every opportunity for self-fertilisation, yet it is doubtful if this ever takes place. Cross-fertilisation appears necessary; that is, the pollen of a flower does not appear to thrive in the conductive tissue of its own stigma. Probably the most effective cross-fertilisation in gum trees is with pollen brought from another tree. This appears to be the work of birds. Wattlebirds, honey-eaters, and brush parrakeets are the principal agents. In one of our mountain trees, E. urnigera, the floral tube is much elongated above the flat top where honey is formed. Parrakeets have a habit with this, as they find a difficulty in reaching the honey, of cutting the tube off with stamens and all. This effects their wish very satisfactorily, but it prevents the formation of seed.

Fruit differs but little from the flowering condition, and when mature and at last become dry, the upper surface of each ovarian cavity splits in the centre, and each side bends upwards as a valve, closing again when moist. Most gum flowers take about two years from the first appearance of the bud till the flower expands. It probably takes equally long for the fruit to ripen, and after ripening this fruit will not open to allow the seed to escape till, for some reason, it becomes dry, when, the valves opening, the boughs swaying in the wind, the minute seed is widely dispersed. Gum seed is very tenacious of life, and germinates freely when years old.

Here is an effective scheme for the restoration of a forest destroyed by fire. Each gum tree has thousands of capsules on it of varying age, each containing a few seeds awaiting their opportunity. A fire kills the branches, but is incapable of burning through the tough capsules. The drying does the rest. The seed is dispersed on ground ready cleared for it. Our bottle brushes and other genera of this family have the same adaptation to avoid extinction by fire, and it is not confined to this family. Many pines never open their cones till they are scorched.

The genus eucalyptus, as already said, contains about a hundred and fifty species, and it is practically confined to Australia, where it forms the principal forest, taking the place of the deciduous trees of the Northern Hemisphere. It would appear to be quite a modern adaptation to Australian conditions. The average Australian climate is not an ideal environment for plant life. Water supply is fitful, light is intense, and fires are common. Eucalypts have very well adapted themselves to this condition, without adopting the vulgar habit of dwindling to insignificant proportions.

Waratah belongs to a family of exceptional interest, not only for its peculiar and often beautiful flowers, but also for the great diversity of the forms of its members, and its present and past distribution. One of the principal genera, living in South Africa, was, from the many different forms of foliage possessed by its species, named protea, which means assuming different shapes. This name, with the customary alteration of its termination, has been adopted to denote the whole family, which is accordingly called proteaceæ. To this family belongs, besides Waratah, our honeysuckle, guitar plant, native pear, mountain rocket, besides grevillea, and many other genera not so commonly noticed in our bush as persoonia, native plum, and white Waratah. The last has quite a different arrangements of flowers from the true article: they are disposed along finger-like stalks and not in dense flat heads.

Waratah has bright crimson, very rarely white, flowers, in dense flat heads at the ends of their branches.

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On Mount Wellington it is a low-spreading shrub of no great beauty, but in more favorable localities towards the west it is often a small tree, and when covered with its bright flowers is a very beautiful object. Its leaves are simply shaped much longer than broad, dark green, and, like those of all the family, of a thick, hard texture, evidently structured to restrain rapid evaporation. This condition is a common adaptation in plants that develop in a climate with excessive sunlight. Though moisture may be present in quantity in the soil, there is a limit to advantageous evaporation. Plants that live in a dry climate or a saline soil also adapt themselves to slow evaporation by a modification in expanse and texture of their leaves, often by their becoming greatly reduced or thick and fleshy. A consistently clouded atomsphere or or local shade is best suited for extensive leave development.

Cross fertilisation in Waratah is effected by birds in quest of honey, massing of the flowers, together, greatly aids this in rendering them much more conspicuous. The individual flowers, of which the cluster is made up, are very peculiar; they differ so much from what we have been in the habit of examining. Instead of a distinct calyx and corolla there is only one row of colored parts—should we call it a calyx or corolla? It matters very little which, as long as we are understood. Being brightly colored, makes it look like a corolla, but botanists, by common consent, called all single circles of these things a calyx. Now, the calyx and corolla are only of secondary importance in a flower; they may neither be present. Flowers may consist of stamens only, or a pistil and yet perform the function of producing seed, so in the present day when we do not wish to bother whether these outer things are calyx or corolla, or both, we commonly call it a perianth.

The perianth of Waratah consists of four rather long, narrow, crimson members, which in the bud adhere to one another along their margin. While still in bud it may be observed that at the end it is rather enlarged and round, also as it approaches maturity it is bent to one side. The flower opens by the four perianth segments, separating, and sharply coiling back. Now the reason of the terminal thickening is shown: The end of each is like a spoon, with a stamen in it. It is obvious also that the curving was caused by the style which had grown long, while yet in the bud, and now stands freely up in the centre of each flower. There is a great similarity in the pistil throughout the family, in that it appears to consist of a single carpel, with a long, simple style, but the number of contained ovules and the condition of the fruit varies greatly, according to the genus.

In Waratah, the ovules are very numerous, and arranged in two rows; they are minute at the time of flowering, but easily observed in the fruit, which is very like a curved, leathery bean, from two to three inches long, which splits open to allow the seeds to escape. These have a well-developed wing on one side, which greatly aids in the dispersal of the seed by wind.

The flowers of all the proteaceæ are very similar; they have all the simple perianth of four portions and four stamens, each one attached to one of these perianth segments, and the pistil is simple. But many differences are found in the development of the perianth and stamens, the number of ovules and condition of fruit, and these are seized upon to split the family into genera. The family is a large one, and in the present day is almost confined to the Southern Hemisphere, a few species only extending up Eastern Asia. It has two great centres of modern development, Australia and South Africa, and the forms of the one are quite distinct from those of the other. The Australian section is much the larger, and extends north to Japan and east to America, but in neither of these extensions does it appear in the numbers found in its home—Australia. Proteaceæ appears to be a very old family that once peopled the earth, but has now almost vanished from the Northern Hemisphere. Why, we can not say.

There are plenty of such problems waiting to be solved. Unless we deny all the evidence adduced we must also recognise that oak, willow, and many other trees now confined to the north once lived in the south. Some geologists contend that till recent times there was a uniform condition of plant life in both hemispheres. This is a first

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conclusion from what appears, and probably, like most first opinions, is wrong. We have yet but the faintest glimmer of the innumerable, large, an small climatic oscillations that have occurred in the earth's history, and all these oscillations have a profound effect upon the migration of both animals and plants. The geologic record is as yet far too scanty to permit of any conclusion. We have recently learnt that the enthusiasm of geologists, in identifying and naming from leaf impressions without sufficient evidence has largely been wrong. The flora of the coal measures has been practically rewritten within the last few years.

There is nothing in our present knowledge of the proteaceae to prove whether the African and Australian section migrated to their present homes directly from the north, or whether the last migration was from a southern continent. If from the latter we should have expected a closer similarity. Everything points to a rather remote divergence. It is very possible that the distribution of Australian genera to the Pacific and South America indicates continuous land at one period, for that area leaving the African forms as a separate migratory track.

Though the species in Tasmania are but few, some of them are of exceptional interest, in that they are found nowhere else. Three of our genera, each with but one species, are found nowhere else. This, to biologists, is considered an indication, not of recent origin, that would be marked by a tendency to much variation, but rather that they were dying out. Guitar plant, native pear, and honeysuckle are common plants of this family. The first is structured, much like Waratah, that is in detail, but it looks very different. Sometimes the leaf is much divided. The flowers are cream colored, numerous in loose bunches. The fruit, when open, resembles a miniature mandoline. The name, native pear, is given to quite a number of different plants—it here refers to the plant whose fruit somewhat resembles a small wooden pear.

The name of the genus is Hakea, which will be a much more sensible name to use than native pear. We have about six species of Hakea in Tasmania, while in Australia they have a hundred. Our forms all have needle-like leaves, but this is not so with all Australian species. This is an excessive progression of the reduction of leaf surface. If a plant has to construct its own food, that is, it is not a parasite, nor does it live upon dead, but ready-formed food; it must have green tissue, exposed to sunlight. Then if leaf-surface has to be reduced to curtail evaporation, it is either directly done or the leaves become obsolete, in which case the surface of the stem remains green, and does the work of food construction. Such a condition is observable in she-oak, native cherry, and others. Our commonest Hakea has somewhat the appearance of a pine, and it is often taken for such. The flowers are small and white, and a few of them grow together in the leaf axils. The notable feature of the genus is the fruit. It is about an inch long, formed of two thick, woody halves, which, when ripe and dry split apart from one another. Inside are a pair of black, flattened seeds, with each a long wing on one side.

Honeysuckle is a small tree everyone knows. Its popular name is no credit to its sponsor. It belongs to the genus banksia, which is not a bad name for popular use. The flowers are numerous, small, pale, and arranged in pairs in a dense cone. They are structured otherwise, as in Waratah. Very few of the flowers set fruit, which is a hard, flat capsule we see buried in the debris of old cones containing two winged seeds in each. There is an interesting thing about the capsule; there is a plate of a hard nature developed between the seeds, which is not permanently attached to the ovarian wall. Its presence has not been satisfactorily accounted for.

All conspicuous flowers as well as others that emit odors are so structured to attract insects or, in a few cases, birds. The advantage to the plant is that pollen is carried from one to another with the result that seed is produced by cross fertilisation. This crossing is so universal throughout both animal and vegetable kingdoms that we can only conclude it is a matter of great importance.

In plants many interesting means are adopted to ensure crossing, yet we find very many plants with special contrivances to prevent it. Some spe

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cies of violet never produce seed from a cross, they bear showy flowers which are not fertile, while the seeds are produced by little insignificant flowers buried in the bases of the leaves that do not open but reproduce entirely with their own pollen.

There is an American water weed common in ponds and sluggish streams. It found its way to England very many years ago and has there flourished greatly yet a male flower has never been found there. From England it found its way to Tasmania and is common in the Jordan and other streams and was once a great nuisance in the Cascade Brewery pond. It bears with us plenty of female flowers but no males.

Again, in the enormous class or Fungi in which are already forty exceptions no fertilisation cross or self, occurs yet we know only too well they have plenty of vigor. Cross fertilisation doubtless aids in increasing variability, but that does not appear to be its primary function and variability can in many instances be observed and propagated without cross, roses and potatos for instance. Whatever be the benefit of crossing to a plant we know that many different contrivances are developed to produce it.

There are two ways in which flowers may be made more conspicuous and thereby attract visitors. One is by each individual flower becoming large and bright, the other by the flowers being massed together. This lattter course is very common and we find all forms of aggregation of small flowers from loose masses to dense heads. In some families this close packing of small flowers has been carried to such a pitch that the head has the appearance of a single flower and is always spoken of as such. If examined carefully it is easy to see such a head is composed of many small flowers, each with its essential organs. It is not a simple but a composite flower.

This condition is found in several families, but in none is it so thoroughly carried out as it is in the family to which belong Daisy, Dandelion, Aster, Marigold, and Everlasting. For this reason the family has been named Compositae. While remembering that composite flowers occur also in other families we will here confine out attention to this one. All through the spring and summer we can find with little difficulty specimens of many species of shrub known as Daisy tree or shrub, the largest of which we also call musk. The flowers are very similar, so any of them will do to examine. When we pick off an individual flower head we note on the outside a series of closely overlapping green bracts reminding us of the calyx of most flowers. As the head is really a mass of flowers these bracts are not a calyx though they look like and function as one. All such bracts surrounding a mass of flowers whether in this or any other family are called an involucre.

Now the composite family is huge. It is the largest of all families of flowering plants, containing about ten thousand species. It can therefore be well understood that much variety of different parts of the head may be found and all these variations are used to break up this great mass of forms into genera. There are a great number of different kinds of involucres. In the common introduced Daisy, Native Daisy, Daisy tree, and Dandelion the bracts of the involucre are relatively small and green, in Thistle they are spiney while in Everlastings they are large spreading and brightly colored. Next we observe few or many, spreading. white or bluish strap shaped, petal-like rays. These are not petals, but each strap is the corolla of a small flower. At the tip of the strap may generally be observed five minute teeth indicating the blending of five petals.

The centre of the head is of a quite different structure. It is yellow or of some shade of purple and close examination will show it to be made up of little tubes opening at the surface. Each tube ends in four or five little lobes and is really a tubular corolla as we have learned to distinguish it in the heath plant. So in our daisy we have two sorts of flowers in the head strap shaped outer ones forming a ray and tubular ones forming a central disk. If we gather a number of different kinds of composites we can sort them roughly into three lots, one structured as above, which is the commonest type, a second lot in which there are no ray flowers but all are tubular, Soldiers' Buttons and a few others, a third lot in which all the flowers are strap shaped, for instance Dandelion.

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Most people like to speak of the head as a flower. Then they use the word floret to indicate the little true flowers. Let us now examine a floret. It will be best to take one from the disk because those of the ray are not perfect. If it is carefully removed from the receptacle, that is the flattened end of the stalk, so as to have it entirely, it will be seen that the lower part is fleshy and we know from our little experience that this will become the seed. At the top of this arises the tubular corolla. It looks at first as in Waratah that there is no calyx. In composites that organ is usually present though sometimes minute, but it is generally so modified that it is not easily recognised. In the flower of Daisy tree the calyx is in the form of a ring of long fine bristles arising from the top of the ovary and closely surrounding the base of the corolla. In our Native Daisies it is reduced to a few small teeth, while in the common introduced Daisy we find no calyx at all.

The calyx is more persistent than the corolla and remains on the top of the fruit where it has become an organ to assist in the dispersal of seed. In days that were earlier the calyx in these flowers was not recognised as such but was treated as a special development to assist dissemination. It was called the pappus and still bears that name as a matter of convenience. This pappus varies greatly according to genus and with the condition of the involucre is much used to separate the plants into groups.

The corolla always arises from the top of the ovary. The petals are always united and tubular at the base, but may be strap shaped or tubular above or some modification between the two. In this disk flower we are examining it is tubular, ending in five small lobes indicating the petals. Now slit the corolla open and examine the essential organs. There are five stamens, each one of which has a free filament which is attached below to the corolla. The anthers united to one another form a tube round the style. This is an almost universal feature amongst composites, the only exception to it is the Bathurst Burr. It is a ready aid to discriminate between the flowers of this and composite flowers of other families as Pincushion and Thrift. The anthers open inwards and shed their pollen into the space between them before the central organ of the flower is mature.

The style which forms the centre of the flower is long and slender and is divided above into two arms. In the immature condition these arms lie close against one another and only the apex of each arm is receptive to the pollen. On the outer surface towards the base of the arms there is commonly an enlargement or some hairs or other contrivance. The style is not fully grown when the pollen is shed into the space between the anthers. It then elongates, carrying up with it on its outer surface the pollen well exposing it for contact with visiting insects. The style branches now open, the receptive apex becomes functional and ready for pollen from elsewhere, its own being already dispersed or effete.

The ovary which, as stated, appears at the base of the floret like a stalk, is simple, containing one erect ovule in the centre. The fruit is not much modified from the condition found in the flower; it is only larger and the ovarian wall tougher. As there is but one seed in each fruit there is nothing gained by it splitting to allow the seed to escape. The ovary falls off with its contained seed and its wall functions as a seed coat. Each fruit is generally called a seed though in reality it is more than that. The calyx, where present, now appears as the pappus, and in special forms, as Dandelion and Thistle, it takes the form of a parachute which greatly aids in dispersal.

The Composite family is not only the largest, but is the most specialised of all flowering plants. Further, it is composed mostly of herbs, comparatively few are shrubs, and none assume the dignity of trees. These and other reasons mark it as the last of the progressive series of evolved forms. It is probable that every tree has descended from a herbaceous ancestor, but a corresponding reduction has seldom taken place.

It may be noted above that the large group into which genera are collected is called a family. Where several families can be shown to have certain

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ommon features leading to the sup-osition that they are related, that is, ppear to have a like descent, it is istomary to group them also together to orders. For instance, the families the Poppies, Fumitories, Crucifers id Capers, are placed in one natural der called Rhoeadinae. These orders e again grouped in classes, of which iere are two of flowering plants, amely Dicotyls and Monocotyls. In ngland it was customary to reverse ie use of the first two names, that is use "order" for a group of genera, id "family" for a group of orders. or the sake of uniformity it has now een agreed that we adopt the contin-ital model stated above.

The flowers described in the pre-ious articles all belong to the Dicotyl ass of the flowering plants. The rm flowering plants is here used to dicate the two classes of plants that ear flowers as popularly known. me botanists prefer to so restrict the se of the name; others extend it to ery aggregation of spore-bearing or-ns, and as this condition passes in-nsibly away till all grouping together spore-bearing organs vanish, so the e term "flower" when so used has no ssibility of definition. Lilies, or-ids, irises, palms, rushes, sedges, asses, and many other families be-ng to the other class, Monocotyls.

One class does not descend from the her. They form two lines of de-ent, that may come down from a mmon ancestor. We have no evi-nce whence, but yet there appears be light dawning. A great num-er of the leaf impressions of our coal easures, upon which the older geol-gists built up an extensive fern flora, re now proved not to be ferns at all, ut seed-bearing plants. The fruiting these plants appears as a transition etween ferns and cycads. This dis-overy of the seed-bearing habit in lants of so early a formation is a elp in the unravelling of history, but as not found our ancestor yet.

There are distinctive features of eneral habit in both classes of flower-g plants that in nearly every case nables us at once to recognise to hich class a plant belongs. In Mo-ocotyls the general structure is less mplex; the leaves are simpler, with arallel veins; the flowers have their parts usually in threes or sixes. In Dicotyls there is generally a greater complexity; leaves when simple have netted veins, and the parts of the flower are usually five, sometimes four, rarely three. But no character can be taken as a sign, and in Monocotyls great specialisation may take place in a family, as, for instance, in the orchids and grasses.

Lily may be taken as a type flower of the Monocotyls. It is a family of world-wide distribution, and within itself has great variety of form, of course within certain limits. But the limits of the family are not well defined. It passes into the rushes without a dividing line. We have to be satisfied with an arbitrary division, and, like all such, the boundary is not universally accepted; consequently, some plants may be placed in one family or the other, according to the taste of the observer. The Australian Blackboy, which with us has received the name of grasstree, which, unfortunately, confuses it with our other grass-trees of the heath family, is a case in point. It may with equal right be placed in either family.

The principal difference between lilies and rushes is the perianth of the former is usually delicate, and white or colored; in the latter it is chaffy and obscure. We have 18 genera of lilies in Tasmania, but most of them are not readily met with. We will take Dianella as a type. This genus is to be found in most parts of the State. The leaves are long and narrow; the flowers numerous and blue; and the fruit is a small dark blue berry. There is no good popular name for this; it is commonly called blueberry, but that clashes with blue climbing berry, which is not a relation. Dianella is the scientific name, but it commends itself to popular usage. The perianth in Dianella is formed of six nearly equal parts, that are but slightly united to one another at the very base. These parts are in two circles of three each, and may be called calyx and corolla if you wish. They appear to be always some shade of blue, and are lined in the centre with from three to seven longitudinal parallel lines. After flowering, the perianth gradually withers and falls off.

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The lily family is a very large one, and it is necessary to note these small characters. They are useful in distinguishing different plants. The perianth of different genera need not be formed of separate segments; in Blandfordia it is tubular, with only short lobes. In some genera, as Stypandra for instance, instead of the perianth falling off when it withers, it remains and twists like a hood over the fruit. The stamens are very interesting. They are six in number. The anthers are rather large, and usually discharge their pollen through a terminal pore. The filaments have a peculiar thickening, that commences close under the anther and extends a short distance or nearly to the base, according to the species. The condition of the stamen is often a useful mark to distinguish genera. In Stypandra, for instance, the anther, after discharging its pollen, coils backwards, and the filament is long, flexed, and covered with minute papillae. In our rock lily, three or six of the filaments, according to species, have a ring of hair-like cells radiating in a circle a little below their anthers.

The pistil is very much the same in all lilies. It is formed of three blended carpels, with three distinct ovarian chambers. In Dianella few seeds are formed in each cavity, but their number varies greatly according to the genus. The style is simple and slender, with a minute head for a stigma. In Dianella the fruit is a dark blue berry. A berry fruit is not always the form found in this family. Many of our forms have a dry fruit or capsule. This difference of fruit means a different means of dispersal. Berries are tempting to birds, and, as in most berries, the contained seed has a very indestructable coat, it can easily be imagined the dispersal advantage gained. In dry fruits the seeds can scatter only as far as the wind may carry them.

We have but few irises in Tasmania, but they make up for that by being very varied in structure, and are, therefore, of great interest to the botanative of Tasmania; what is meant here is the iris family. The character by which a member of the iris family may be known is that the perianth arises from the top of the ovarian portion of the pistil instead of below it, as in lily, so that the fruit is formed below the flower. The stamens are usually three in number, but a more constant feature is that the anthers always open outwards, and not inwards, as in allied families. In the Amaryllis family, of which we have few members, the stamens are three or six, and open inwards.

Our white flag has a horridly long name, Diplarrhena moroea. The first or generic name means two stamens, a character of the genus, and moroea means that it looks very like a moroea, which is a South African genus. The student will observe the haphazard way in which the scientific names of plants are constructed. They are often founded upon a person's name, and please his little conceit for a portion of a generation, after which he will in all probability be forgotten. It would appeal to any ordinary person that if a sign of the genus could be used for the first and one of the species for the second, they would serve their purpose better. But this is not as easy to do as to desire. In many instances it appears impracticable. One of the greatest barbarities I have known in plant naming is with a rare little Tasmanian plant, known to science as Thismia Rodwayi. The first name, though euphonious, is compounded of Thomas Smith; the second marks he who accidentally found it. This seems simply shocking.

White flag has six perianth segments in two series; the outer three are broad and spreading; the inner three narrow and erect. There are three stamens, but one is rudimentary. The style which arises from the centre of the flower is slender, and is divided at the top into three unequal branches. The fruit is a three-chambered capsule, each containing many flat seeds.

In heathy country we often find an iris with blue flowers, this is remarkable for the rapidity with which it withers when gathered. It has a long tube to the perianth, and on top of this three broad spreading lobes and three inner, small, erect ones. It is Patersonia glauca. The first name immortalises Colonel William Paterson, who did good work in Australian botany in the early part of last century. Glauca means a blue-grey color.

not the real iris

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We have in Tasmania an iris of most unusual interest. It has six perianth divisions, nearly equal, generally brownish purple, sometimes yellowish white, and the typical three outward bursting anthers, only it differs from the type of the family in the perianth being inserted on the pistil and nearly at its base. On account of this, it is usually placed amongst the lilies, but that is not its natural home. Up to the present it has only been found in the west and south-west of our State. Its name is Newardia Tasmanica.

We are all familiar with the prevailing green color of plants, but we do not all think what this means. By means of their green color plants have a power which no other beings possess, namely, that of building up the compounds that form their food and the whole of the food of other beings, both plants and animals. This is not absolutely true, as there are lowly organisms that do some building up without the aid of this, but their work is sufficiently insignificant to permit of their being neglected. All plants and animals ultimately derive the substances of which their bodies are made up from material first formed in and by the green tissues of plants.

The atmosphere contains a small proportion of carbonic acid gas, on the average about four parts in ten thousand. This gas consists of carbon dioxide combined with water. The green portions of plant cells have the power when sunlight is permeating them of splitting off two parts of oxygen from a molecule of this, leaving a gas consisting of one atom of carbon, two of hydrogen, and one of oxygen. This is known as formic aldehyde, and is the basis from which all sugars and starches are formed. In most plants the first apparent result of this action is that grains of starch appear in the cells of the green tissue. This starch consists of one of the materials called sugar, minus one molecule of water. This sugar consists of six molecules of the aldehyde, that is six of carbon, twelve of hydrogen, and six of oxygen. It would be a simple thing to suppose that the process really was that by means of light, plant-green cut off two atoms of oxygen from a molecule of carbonic acid forming, thus formic aldehyde, and that then six molecules of this combined to form sugar, after which one molecule of water was removed, leaving granules of insoluble starch. We know the process is much more complicated, but the result is the same.

The sugar is next combined with the nutritive materials brought up from the roots to form the numerous and complex materials of plant and animal bodies. The leaf looks uniformly green, but that is because the unassisted eye cannot see clearly enough. The microscope shows us that the green color is confined in the leaf cells to little oblong or round bodies, few or many in each cell. These are definite living organs of the cell whose function it is to do this work. These little organs or plastids, as they are called, are present in most cells, green or otherwise, they change sugar into starch and vice versa, but only those that are green can form these from crude material. We observe this, but cannot explain it. The green material appears to be related to wax, and is capable of being extracted from the tissue. If a plant is grown in the dark it is pale; it only turns green upon exposure to light. Also a plant grown in material not containing iron does not become green. This is singular, for plant-green does not contain iron.

A plant like an animal has its own peculiar constitution. Some can live only in a shady situation, others require free exposure to bright light, but intense light is never beneficial. We have noted the way in which some plants have adapted themselves to a consistently sunny climate. Plants that have not adapted themselves permanently endeavor to reduce undue exposure of their plastids to strong light by rearranging them in the cells. In dull light the green plastids are arranged along the walls of the cells that are at right angles to the incident rays, but in intense light they place themselves along the perpendicular walls. A suitable leaf will show this by being a lighter green immediately after exposure to intense light than after a period of shade. Or, better still, if a living leaf of our imported laurel that is freely exposed on a bright day has placed on its surface a piece of lead foil or dark paper after some time if the protection be removed the pattern will be seen on the leaf of a darker green than the rest.

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All plants do not possess plant-green. None of the fungi do, for instance. Where they do not they feed as an animal does by absorbing and breaking down complex compounds that had been built up by green plants. As long as these non-green plants confine their attention to the dead remains of other plants they do more good than harm; they break up refuse material to enable it all the sooner to become the food of future generations. But some of these acquire the habit of attacking the bodies of both animals and plants, and the disturbed conditions they set up in the body of their victim, which is popularly known as a disease, may not only cause great injury, but in many cases even death. Typhoid, plague, and consumption in man, just as rust, black spot, and leaf curl in plants, are caused by minute plants that have acquired the parasitic habit.

Parasitism in plants is not confined to the lower orders. Some of the higher forms have also adopted this mode of life, and a great number are in the position of partial parasites; that is, they form food for themselves while at the same time they levy toll on their neighbours. In Tasmania we have only two genera of flowering plants which are about thoroughly parasitic. In both genera the habit is the same. All trace of leaves and roots has gone. The shoot is reduced to the appearance of string that winds irregularly about its victim, sending into its tissue every here and there a little sucker to withdraw its sap. One of these genera, Cassytha, is very common; it is often called mistletoe, and forms masses of every growth on shrubs. The other genus is Cuscuta or Dodder. Of this we have a rare native and a commoner imported species. This latter is to be found on Lucerne, and where it appears it causes great havoc. Cassytha is a degenerate laurel, and has the typical stamens of that genus, each pollen chamber opening by a little upturning flap.

It may be well to note here that neither the imported nor the native laurels really belong to the laurel family; they bear the name through the usual indiscriminate manner in which popular names have been applied. Baytree is a true laurel. Sassafras is also near it. The native potato, an orchid with dusky stem and flowe and the pretty pink spotted orch both fairly common are also parasite When very young they fasten on t the roots of other plants, and grad ally develop large tubers of reser food. When they have accumulate sufficient they send up their flowerin stalks.

The most noticeable family of pa tial parasites we have is that of th native cherry and its allies. The belong to the Sandalwood family, a the members of which are more o less parasitic. Our cherry has leav reduced to little scales, and the wor of assimilation is performed by th green branches. When young it i self-supporting, but it does not d velop well if obliged to continue mak ing its own food. When its root come in contact with the roots o other plants it sends suckers int them, and flourishes upon the nutri ment drawn from them.

Our Euphrasias, sometimes know as Eyebright, are probably also pa tially parasitic, but the connectio with the roots of other plants has no yet been demonstrated. A habi equally interesting is that of catchin insects or other small animals, an consuming their soft parts. We hav two families which do this. The com monest, the Sundews, botanicall known as Drosera, from droseros dewy, have the upper surfaces of th leaves studded with little slender pr cesses at the tip of each a minut drop of pellucid sticky fluid is formed When a small animal gets on the lea these processes bend over it, it be comes smeared with the fluid and dies. The fluid contains a substanc closely allied to the pepsin of gastri juice which dissolves the meaty por tions of the animal, which is then absorbed into the plant for its use. A small cube of white of egg or ra meat is a convenient thing to exper ment with.

Droseras can live without, but d better with, animal food, but if fe with too much it disagrees with them Sundews are very common. One with large leaves divided like a tuning fork D. binata, is a rather fine plant, while D. pygmoea is a minute little re plant about the size of a shilling The other family is not so often noticed, yet it is fairly common i

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wet places. It is a very interesting family to the botanist, as it develops no roots, but in their place the leaves take on many shapes, and do duty for roots or underground stems as circumstances require. In water the leaves become much divided and threadlike, and develop little utricles with peculiar mouths. These are traps; an animal can enter, but cannot get out again. Peculiar four-starred hairs on the inside of these sacks form a similar ferment to that of Sundew, which kills and consumes the imprisoned animal.

From the presence of these utricles the genus has been named Utricularia. Our largest species, *U. dichotoma*, commonly known as Butterfly Plant, grows about six inches high, and bears at the top of a slender stalk usually two conspicuous purple, rarely white, flowers of irregular form. It is common on the damp heaths just beyond Kingston. Another species, *U. lateriflora*, only one or two inches high, with a few small flowers along the slender stem, may be found on wet ground by the side of the Sandfly road, close to Longley.

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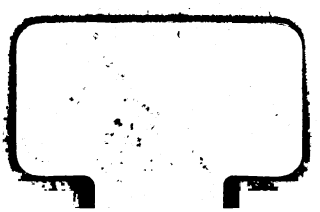

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